

REMARKS

Entry of this Preliminary Amendment is requested. Applicants hereby respond to the final Office Action dated September 4, 2002. For the sake of completeness, Applicants hereby enclose an information disclosure statement (IDS) citing references in the specification. Also, enclosed is a copy of an abstract for JP 10152327 A. JP 10152327 A discloses background information only.

1. Claim Rejections - 35 U.S.C. § 112

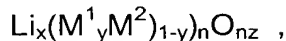
The Office Action rejected Claim 3 on the grounds that Claim 3 recites the limitation "for impregnating the M¹ compound." In view of the modifications above, the rejection is believed overcome. Reconsideration is requested.

2. Rejections under 35 U.S.C. §103

1. Claims 1 and 3-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over FR 2704216 (Yazami) in view of U.S. Pat. No. 5,180,574 (Von Sacken) and U.S. Pat. No. 5,702,679 (Sheargold). The rejection should be withdrawn in view of the remarks below.

It is well-settled that to establish a *prima facie* case of obviousness, the USPTO must satisfy all of the following requirements. First, the prior art relied upon, coupled with the knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references. *ProMold v. Great Lakes Plastics*, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996); *In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Second, the proposed modification must have had a reasonable expectation of success, as determined from the vantage point of one of ordinary skill in the art at the time the invention was made. *Amgen v. Chugai Pharmaceutical Co.* 18 USPQ 2d 1016, 1023 (Fed Cir, 1991), *cert. denied* 502 U.S. 856 (1991). Third, the prior art reference or combination of references must teach or suggest all of the limitations of the claims. *In re Wilson*, 165 USPQ 494, 496, (CCPA 1970). The Office Action did not establish a *prima facie* case of obviousness.

Applicants' invention relates to a process for preparing lithium transition metallates of the general formula



wherein

M^1 represents nickel, cobalt or manganese,

M^2 represents chromium, cobalt, iron, manganese, molybdenum or aluminium and is not identical to M^1 ,

n is 2 if M^1 is manganese, otherwise 1,

x is a number between 0.9 and 1.2,

y is a number between 0.5 and 1.0 and

z is a number between 1.9 and 2.1.

The process involves calcining an intimate mixture of oxygen-containing transition metal compounds and an oxygen-containing lithium compound, which has been obtained by treating a solid powdered transition metal compound, with a solution of the lithium compound and drying, in which at least the M^1 compound is used in the form of a powder with a specific surface area of at least $10 \text{ m}^2/\text{g}$ (BET) and calcination is performed in a moving bed.

Applicants' invention is fundamentally different from Yazami. The Office Action's opinion that Yazami teaches the claimed invention except for the requirement that the calcination is carried out on a moving bed is not correct. Although Yazami discloses the specific surface area of the product being between 1.5 and $50 \text{ m}^2/\text{g}$ (p. 3, lines 5-7), Yazami is completely silent about the specific surface area of the starting compounds. Applicants' invention requires that at least the M^1 compound (a starting compound), be used in the form of a powder with a specific surface area of at least $10 \text{ m}^2/\text{g}$ (BET). This is an important feature of Applicants' invention because due to the large specific surface area of the transition metal compound, undesired agglomeration of the product and caking at the limiting walls of the moving bed is avoided (See Specification, page 4, lines 1-3). Reconsideration is requested.

One of ordinary skill in the art would not have been motivated to combine Von Sacken and Sheargold as alleged by the Office Action.

Von Sacken teaches that a hydride of lithiated nickel dioxide is applied as a cathode active material. This substance is different from the substance required by Applicants' invention. A hydride of a lithiated nickel dioxide is supposed to be disadvantageous compared to a pure lithiated nickel dioxide as it can happen that the remaining H, which is potentially due to humidity in the material, (as is indicated in column 6 lines 19) can create side reactions with the electrolyte.

Another significant difference is that the mixture prepared for the heat treatment in Von Sacken is only mechanically mixed (column 9, lines 5-10). Applicants' invention as encompassed by Claim 1 treats a powdery transition metal with a solution of the Li-compound under conditions that allow the dissolved Li-compound to migrate into the pores of the transition metal compound, e.g. $\text{Ni}(\text{OH})_2$, which remains unsolved. As such, a relatively more homogeneous precursor is achieved than can be the case for a mechanical mixing process or a dry mixing process. Due to this precursor preparation, Applicants' invention, it is emphasized that a high surface area of the transition metal compound is required as this means a higher amount of accessible pores in which the lithium nitrate can penetrate.

Von Sacken does not teach about a high surface area of the transition metal compound. Indeed, Von Sacken was not envisioning to obtain a homogeneous mixture of precursor even within one single transition metal compound particle by enforcing the penetration of the Li-compound into the transition metal compound pores. Von Sacken was only envisioning to achieve that the Li-compound particles are in close location towards the transition metal compound particles. Also in all the examples that are described, the utilization of NiO instead of $\text{Ni}(\text{OH})_2$ is stated while it is known that NiO has a significant lower specific surface area than $\text{Ni}(\text{OH})_2$. One of ordinary skill in the art would not have been motivated to combine Von Sacken as alleged by the Office Action. Reconsideration is requested.

Similarly, Sheargold does not contain teachings that would have motivated one of ordinary skill in the art following Yazami to combine Sheargold as alleged by the Office Action.

Sheargold teaches a continuous method of preparing a single phase lithiated manganese oxide intercalation compound of the formula $\text{Li}_{1+x}\text{Mn}_{2-x}\text{O}_4$ comprising the steps of: mixing intimately a lithium hydroxide or a lithium salt and a manganese oxide or a manganese salt; feeding the intimately mixed salts to a reactor; continuously agitating the mixed salts in the reactor; heating the agitated mixed salts in the reactor at a temperature of from about 650°C to about 800°C for a time not in excess of about 4 hours in an oxygen-containing atmosphere; and cooling the reacted product to less than about 200 °C in an oxygen-containing atmosphere for a time not in excess of about 2 hours.

Sheargold does not teach the preparation of a variety of lithium transition metallates, but only with the preparation of spinel, $\text{Li}_{1+x}\text{Mn}_{2-x}\text{O}_4$, which exhibits a different structure as well as a contrastive behavior compared to, for example, lithium nickel oxide (LNO). On page 1 of Sheargold starting from line 64, Sheargold teaches that a spinel-type material can be already produced at a reaction temperature as low as 300°C. In case of utilization of LiNO_3 as Li-compound, which has a melting point of roughly 250°C. This means that the melting phase of LiNO_3 only exists over a temperature range of roughly 50°C, as above 300°C the reactant is already converted into the product, LiMn_2O_4 .

By contrast, LNO is solely formed at a temperature above 600°C, meaning that the temperature range for the existence of melted LiNO_3 is significantly broader (about 350°C) and therefore, due to the much longer existence of the melting phase, will create larger problems with regard to stickiness on the reactor wall. Therefore the appliance of a reactor that exhibits a moving system is much simpler for the manufacture of LiMn_2O_4 than for LNO.

Further, in the case of LNO, the reactants, the Li-compound and the Ni-compound are applied with a molar ratio of roughly one. However, in case of a spinel, the ratio is shifted towards the Mn-compound and the molar ratio Li:Mn amounts to roughly 1:2. This means that relatively speaking the Li-compound within the precursor for the spinel production is less dominant than within the precursors

Mo-5969 - 7 -

for the LNO-production, and thus the melting of the Li-compound prior to reaction plays for the spinel process a minor role compared to the LNO process, which of course directly corresponds to less engineering problems regarding the stability of the process. From the fact that a moving bed process for the preparation of spinel is possible one of ordinary skill in the art would not have concluded that this is also true for the preparation of other lithium transition metallates.

As such, one of ordinary skill in the art would not have been motivated to combine Von Sacken and Sheargold as alleged by the Office Action.

Reconsideration is requested.

2. Claims 2 and 6-9 were rejected over Yazami in view of Von Sacken and Sheargold as applied above further in view of U.S. Pat. No. 5,728,367 (Mao). The rejection should be withdrawn in view of the remarks below.

Applicants' invention relates to a process according to Claim 1, in which the transition metallate is milled and sieved after calcination and the finer fraction from sieving is recycled to the moving bed.

As discussed above, Applicants' invention encompassed by Claim 1 is fundamentally different from Yazami. Further, one of ordinary skill in the art would not have been motivated to combine Von Sacken and Sheargold as alleged by the Office Action.

With respect to Von Sacken, Von Sacken teaches the use of a hydride of lithiated nickel dioxide is applied as a cathode active material, a substance which is different from the substance required by Applicants' invention. Von Sacken mechanically mixes the mixture prepared for the heat treatment and does not teach using the conditions required by Applicants' invention. Von Sacken does not teach about a high surface area of the transition metal compound.

With respect to Sheargold, Sheargold does not teach preparing a variety of lithium transition metallates, but only teaches preparing spinel, $\text{Li}_{1+x}\text{Mn}_{2-x}\text{O}_4$, which exhibits a different structure as well as a contrastive behavior compared to, for example, lithium nickel oxide (LNO). Sheargold is fundamentally different from Applicants' invention. Reconsideration is requested.

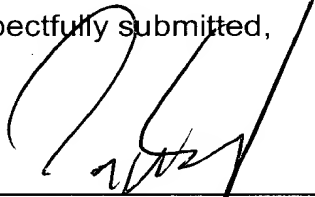
In summary, neither Yazami, Von Sacken, nor Sheargold, singly or in combination, obviated Applicants' invention. Neither Yazami, Von Sacken, nor

Sheargold, singly or in combination, coupled with the knowledge generally available in the art at the time of the invention, contains some suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references as alleged by the Office Action and practice Applicants' invention. Second, the proposed modification does not have a reasonable expectation of success, as determined from the vantage point of one of ordinary skill in the art at the time the invention was made. Neither Yazami, Von Sacken, nor Sheargold, singly or in combination, teach or suggest all of the limitations of the claims.

In view of the remarks above, a Notice of Allowance is earnestly requested.

Respectfully submitted,

By



Diderico van Eyl
Attorney for Applicants
Reg. No. 38,641

Bayer Chemicals LLC
100 Bayer Road
Pittsburgh, Pennsylvania 15205-9741
(412) 777-8355
FACSIMILE PHONE NUMBER:
(412) 777-8363

/jme/DVE/DE0439